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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/021.785	12/14/2001	Robert Barry Leholm	A33884-A - 007220.0159(20)	3429

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EXAMINER
PITTMAN, ZIDIA T

ART UNIT	PAPER NUMBER
1725	

DATE MAILED: 01/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

## Application No.

10/021,785

## Applicant(s)

LEHOLM ET AL.

## Examiner

Zidia Pittman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on 14 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☐ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4,5. 6) ☐ Other:

### DETAILED ACTION

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Kalin et al (*Brazing Thin Sheet Structures of Titanium Alloys...*).

Kalin et al teaches that in diffusion brazing thin sheet structures of titanium and its alloys, brazing alloys are in the form of rolled foils, sprayed layers, powders, and paste. At present, special attention is given to the use of amorphous brazing alloys in the form of thin flexible ductile foils 40-60  $\mu\text{m}$  thick and 5-50 mm wide. Having high chemical and structural homogeneity as a result of the amorphous (glassy) state, and the effect of the so-called 'instantaneous' melting throughout the entire volume of the material, the amorphous brazing alloys make it possible to minimize the undesirable effect of the thermal cycle of brazing on structural transformations in titanium and its alloy. The proposed technology is used to produce tape brazing alloys with the completely amorphous structure, uniform distribution of components with a thickness of the tape (the deviation of the content of the main and alloying components on the free and contact (facing the quenching disc) surfaces does not exceed 0.2 at %) and a low content of gaseous impurities. Laboratory and simulation specimens of titanium alloys

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were brazed with CTMET amorphous brazing alloys and VPr 16 powder brazing alloy (containing 8-16% Ni, 11-14% Zr, 21-24% Cu, Ti-balance, TU 14-1-2703-79) in an SNV-2 vacuum furnace under the following conditions: the medium in the working space of the furnace; heating rate 20°C/min; brazing temperature for CTMET 1201 brazing alloy (950-980)  $\pm$  10°C, for CTMET 1403 840  $\pm$  10°C, VPr 16 940  $\pm$  10°C; brazing time 5-30 min; assembly gap for brazing 0.05-0.1 mm. These conditions show vacuum tightness and high mechanical properties of the brazed joints. (page 234, columns 1 and 2)

Claims 1-5, 10-16, 20, and 25-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Parker (USPN 3,981,429).

Parker teaches a method for plated foil liquid interface diffusion bonding of titanium. Referring to the drawings in detail, Figure 1, shows a fragment of the honeycomb core for a honeycomb sandwich panel of type commonly used in aircraft and other structures where a structural panel of high strength, stiffness, and light weight is required. The core and its usual two facing sheets are of titanium or a selected titanium alloy. Sheets of plated foil of titanium or selected titanium alloy are interposed, respectively, between the facing sheets and the core. In preparing the foil sheets, both sides of each sheet are surface-etched by a suitable etchant, for example, one containing sulfuric and chromotropic acids, to a uniform rough texture similar to that obtained by dust blasting, with a resultant foil thickness of the order of less than 0.001 inch. This thickness is not critical, but preferably does exceed 0.0006 inch. The foil is then subjected to a thorough cleaning process. It is recommended that the ultimate

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possible degree of chemical cleanliness of the foil surface be attained, since any foreign matter in the resultant joint would be deleterious.

The etched, cleaned foil is then plated, preferably on both sides, with a layer or successive layers of suitable, compatible brazing metal or metals which will provide the required diffusion bridge, and will diffuse in the resultant bonded joint. A plating procedure of optimum effectiveness and desirability probably has not yet been found, since a great many of the elements of the periodic table react in compound form with titanium, and research is still in progress to discover better plating materials and procedures for use in the practice of the invention. The presently preferred plating procedure is Cu-Ag-Ni in that order on each side of the etched foil with an overall coating of 6 g/ft<sup>2</sup> thickness on each side. The presently preferred percentages of the plating metals are Cu 38%, Ni 38% and Ag 24%.

In bonding the parts shown in Figure 1 in accordance with the invention, the facing sheets and the honeycomb core are cleaned to a high degree of chemical cleanliness by the same process as that used to clean the foil, and the plated foil sheets are interposed, respectively, between the facing sheets and the core. The assembly is then subjected to required pressure toward the foil, in the nature of a conventional braze package and in accordance with the procedure set forth in the aforementioned applications, in a suitable inert, atmosphere, under partial vacuum, or under hard vacuum of the order of 10<sup>-4</sup> Torr. The parts are then heated to a temperature which renders liquidus plating metal or metals on each plated side of each interposed foil

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sheet, thereby establishing a liquid bridge between each side of the foil sheet and the faying surface of the adjacent member.

With the plating materials Ag-Cu-Ni mentioned, an initial temperature of the order of 1780°F has been found satisfactory. After at least a portion of the plating material has been rendered liquidus to thereby establish an atomic bridge between each side of the foil and its adjacent member, the heating is continued at a temperature to promote required atomic diffusion across the bridge thus established. Since the time and temperature required for such bonding may vary with the eutectic effect of various plating materials employed, such parameters will be determined by conventional calculations and test procedures for each structure, part material, and plating or materials employed. However, temperatures within the range 1450-1800°F, and usually about 1780°F, have been found satisfactory for the foil liquid interface diffusion bonding of the component parts of a titanium honeycomb core sandwich. (abstract; Figure 1; column 2 line 17 – column 3 line 24)

Claims 1-5, 10-16, 20, and 25-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Norris et al (USPN 4,869,421).

Norris et al teaches a method of jointing titanium aluminide structures. Referring to Figure 1, there is seen an exploded view of an assembly which includes a honeycomb core, a pair of metal foil interlayers and a pair of face sheets. Honeycomb core is formed from a titanium based alloy by any suitable manufacturing process. While core may be formed from an alloy which consists primarily of titanium, titanium aluminides are strongly preferred for their high strength-to-weight ratio at elevated

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temperatures and other desirable physical and chemical properties, despite the difficulty of diffusion brazing them by prior methods. Typically, the titanium aluminide should comprise from about 20 to 80 atomic % titanium with the balance aluminum. Minor alloying additions are also included in most alloys. Titanium aluminide alloys are available commercially. While titanium is generally only useful at temperatures up to about 1100°F., titanium aluminide can be used at temperatures up to about 1500°F and sometimes up to 1800°F.

Interlayers are thin metal foils consisting essentially of nickel and copper. The eutectic of the interlayer with the titanium aluminide base metal has a melting temperature significantly lower than that of the base metal core and base metal face sheets. Interlayer may be electrodeposited on the faying surface or either or both face sheets or core, if desired or by powder deposition, plasma spraying, or vapor deposition or the like. The thickness of interlayer should be in the 0.000025 to 0.003 inch range for the best combination of maximum strength and minimum weight. Optimum results are obtained with a homogeneous alloy interlayer thickness of about 0.0002 inch. Face sheets should be titanium aluminide alloys.

The method of this invention is performed by cleaning the surfaces to be joined, stacking the components, placing the resulting assembly in an oven, pressing the stacked assembly in an inert atmosphere or vacuum to at least the melting temperature of the eutectic of the interlayer with the base metal. The assembly is held at that temperature for a selected period to complete wetting of the faying surfaces and the desired degree of diffusion into the surfaces to allow isothermal solidification, then the

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assembly is cooled, producing a uniform, high strength join. (abstract; Figure 1; column

2 line 41 – column 4 line 12

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